

REMARKS

Claims 1-9 were originally presented in the subject application. Claims 1-9 were canceled, and claims 10-18 added, in a Preliminary Amendment dated December 14, 2005. Claim 10 was amended, and claim 19 added, in a response dated September 9, 2008. Claim 10 was amended in a response dated April 28, 2009.

Claim 10 has hereinabove been amended to correct two typographical errors in the response dated April 28, 2009, and to more particularly point out and distinctly claim the subject invention. No claims have herein been canceled or added. Therefore, claims 10-19 remain in this case.

For the convenience of the Examiner, the following text is repeated from the response dated April 28, 2009:

The addition of new matter has been scrupulously avoided. In that regard, support for the amendment to claim 10 regarding the separator consisting of only ultrafine fibrous aggregate prepared by an electrostatic spinning process, can be found in the specification at paragraph 0029. Support for the claim 10 aspect of heat-treatment at 160° C or higher can be found in Examples 1 and 7. Finally, support for the claim 10 aspect of a separator mass per unit area of 1 to less than 5 g/m² can be found in paragraph 0037. Likewise, support for the addition of claim 20 can be found in the application at paragraph 0037.

Applicants respectfully request reconsideration and withdrawal of the grounds of rejection and objection.

35 U.S.C. §103 Rejection

The final Office Action rejected claims 10-13, 16-17 and 9 under 35 U.S.C. §103(a), as allegedly obvious over JP 3-161563 (hereinafter, "JP563") in view of Takase et al. (U.S. Patent Application Publication No. 2002/0090876) and JP7-279024 (hereinafter, "JP024"). The final Office Action also rejected claims 10 and 15 under 35 U.S.C. §103(a), as allegedly obvious over JP563 in view of Machine Translations of JP2003-105660 (hereinafter, "JP660") and JP024. Further, the final Office Action rejected claims 10-13, 16-17 and 19 under 35 U.S.C. §103(a), as allegedly obvious over JP563 in view of Takase and JP8-339819 (hereinafter, "JP819"). Finally,

the final Office Action rejected claims 10 and 15 under 35 U.S.C. §103(a), as allegedly obvious over JP563 in view of JP660 and JP819. Applicants respectfully, but most strenuously, traverse these rejections as they relate to the amended claims.

Amended claim 10 recites a separator for an electric double layer capacitor, the separator consisting only of an ultrafine fibrous aggregate prepared by an electrostatic spinning process and heat-treated at 160° C or higher, a thickness of the entire separator is 25 μm or less, an average fiber diameter of ultrafine fibers constituting the ultrafine fibrous aggregate is 1 μm or less, a maximum pore size of the ultrafine fibrous aggregate is not more than 3 times a mean flow pore size, an apparent density of the ultrafine fibrous aggregate is 0.1 to less than 0.27 g/cm^3 , and a mass per unit area of the separator is 1 to less than 5 g/m^2 .

With regard to the claim 10 aspect of a mass per unit area of the separator of 1 to less than 5 g/m^2 , as noted in the present application at paragraph 0037, the specific mass per unit area can impart an excellent ionic permeability to the separator. More particularly, Tables 1 and 2 of the present specification show that the internal resistance (2.3 Ω) of the capacitor using the separator having a mass per unit area of 5.9 g/m^2 , prepared in Comparative Example 6, was higher than that (2.1 Ω) of the capacitor using the separator having a mass per unit area of 4.6 g/m^2 , prepared in Example 1; that is, the separator prepared in Comparative Example 6 was inferior in ionic permeability to that prepared in Example 1.

The Rule 132 Declarations filed herewith of inventors Masaaki Kawabe and Takeshi Kobayashi show and describe an experiment and evaluation in which the heat treatment aspect of claim 10 lowered the leakage current as compared to no heat treatment, and as a result, the fractional defective was remarkably improved. According to the Declaration of Takeshi Kobayashi, heat treatment at 160° C (Example 1 in the present application) as compared to no heat treatment (the experiment described in the Declaration of Masaaki Kawabe) resulted in leakage currents of 0.012 mA and 0.017 mA, respectively. Therefore, the heat treatment lowered the leakage current, giving a fractional defective of zero and 60%, respectively.

Returning to the substantive rejection, Applicants submit that none of the cited references, nor their combination, teaches or fairly suggests at least the claim 10 aspects of mass per unit area

in the claimed range or heat treatment of the fibrous aggregate prepared by electrostatic spinning at the claimed temperature.

For example, none of JP 563, JP819 or Watanabe '224 even disclose a mass per unit area. As another example, each of Takase, JP024, JP660, Thrasher '171 and Kimura disclose a surface density (i.e., mass per unit area) of higher than the claimed range. JP660, for example, discloses that the mass per unit area of a separator is above the claimed range in view of mechanical strength, and JP024 discloses that the mass per unit area of a separator is above the claimed range in view of strength, ununiformity of mass per unit area, short circuit, and battery properties. Finally, none of the cited references teaches or suggests the claimed heat treatment.

In addition, the separator of the present invention has advantageous effects unexpected from the cited art. The inventive separator has excellent ionic permeability, liquid-holding rate under pressure, internal resistance, leakage current, and fractional defective. These qualities are due to the ultrafine fibers being prepared by an electrostatic spinning process and having an average fiber diameter of 1 μm or less, are uniformly dispersed in the ultrafine fibrous aggregate, have a maximum pore size of the ultrafine fibrous aggregate of not more than 3 times a mean flow pore size, a mass per unit area of the separator of 1 to less than 5 g/m^2 , a thickness of the entire separator of 25 μm or less, and an apparent density of the ultrafine fibrous aggregate of 0.1 to 0.27 g/cm^3 .

More particularly, Applicants submit that a short circuit cannot be avoided by a separator having a mass per unit area of 1 to less than 5 g/m^2 , and thus, ultrafine fibers having an average fiber diameter of 1 μm or less are uniformly dispersed to impart the property of preventing a short circuit. Further, if the thickness of the separator is 25 μm or less to improve the ion permeability, but the ultrafine fibers are closely in contact with each other, the ion permeability would be lowered. To solve this problem, adequate interstices are formed by rendering the ultrafine fibrous aggregate layer bulky (i.e., an apparent density of 0.1 to 0.27 g/cm^3) to improve the ion permeability.

Furthermore, the leakage current can be reduced by the heat-treatment at 160° C or higher, and, as a result, the fractional defective is remarkably improved. This advantageous effect is unexpected from the cited art.

Therefore, for at least the reasons noted above regarding the claim 10 aspects argued, Applicants submit that the claims cannot be rendered obvious over the cited combinations of references as they all depend directly or ultimately from claim 10.

CONCLUSION

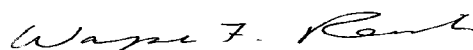
Applicants submit that the dependent claims are allowable for the same reasons as the independent claims from which they directly or ultimately depend, as well as for their additional limitations. In addition, Applicants do not acquiesce to any allegation or characterization in the Office Action, including, for example, "well-known in the art" or similar allegations or characterizations made in the Office Action. Further, unless specifically set forth otherwise, Applicants request proof of any such allegations or characterizations in the form of properly cited prior art or other allowed evidence.

Applicants acknowledge the references cited in the Office Action, but not substantively applied. However, Applicants submit that the pending claims are patentable thereover as well.

For all the above reasons, Applicants maintain that the claims of the subject application define patentable subject matter and earnestly request allowance of claims 10-19.

If a telephone conference would be of assistance in advancing prosecution of the subject application, Applicants' undersigned attorney invites the Examiner to telephone him at the number provided.

Respectfully submitted,



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Dated: May 14, 2009.

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